AMENDMENTS TO THE DRAWINGS

The attached sheets of drawings include changes to Figures 1-3. These sheets replace the original sheets including these same Figures.

As can be seen, in the response to the Examiner's requirement concerning the labeling of the drawings, Figures 1-3 are labeled as "Related Art".

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-20 are pending, with claims 1, 3-10 and 12-17 amended by the present amendment. Claims 1, 8 and 17 are independent.

In the Official Action, the specification was objected to; claim 17 was objected to; claims 1, 5-8 and 14-18 were rejected under 35 U.S.C. § 102(a) and/or 35 U.S.C. § 102(e) as being anticipated by Hallberg, U.S. Patent No. 6,658,199); claims 9-10 were rejected under § 103(a) in view of Hallberg and Ando (U.S. Patent No. 6,453, 116); and claims 2-4, 11-13 and 19-20 were indicated as containing allowable subject matter.

Applicant acknowledges with appreciation the indication of allowable subject matter.

Claim 17 and the specification are amended as requested in the Official Action. Figures 1-3 are labeled "Related Art." Claims 1, 3-10 and 12-16 are amended to avoid an unintentional interpretation under 35 U.S.C. § 112, sixth paragraph. No new matter is added.

Applicant acknowledges with appreciation the telephone discussion between the Examiner and Applicant's representative. During the discussion, the Examiner appeared to acknowledge that Hallberg does not explicitly or inherently describe a VBV buffer configured to output a buffer status to the transmission control unit, as recited in independent claims 1 and 8. The Examiner also appeared to acknowledge that Hallberg docs not disclose or suggest a) incrementing or decrementing an STC (system time clock) count according to a direction of a

trick play mode; or b) adjusting DTS (decoding timestamp) of a picture to be decoded according to the direction, as recited in claim 17.

Briefly recapitulating, amended claim 1 is directed to

> In a system recording and playing back a transport stream transmitted by a digital broadcast, a digital video record/playback apparatus comprising:
>
> an output control unit configured to output a predetermined playback mode;
>
> a transmission control unit configured to control a transmission bit rate and transmission time point of the transport stream based on the predetermined playback mode ***and VBV (video buffering verifier) buffer status information***;
>
> a demux configured to perform an STC (system time clock) count initialization and STC count control on a PCR (program clock reference) packet of the transport stream inputted via the transmission control unit, the demux configured to extract ES (elementary stream) data for a program data packet of the transport stream;
>
> a VBV buffer configured to temporarily store the extracted ES data, the VBV buffer configured to play a role in buffering between the transmission bit rate and a decoding frame rate, ***the VBV buffer configured to output a buffer status to the transmission control unit***; and
>
> a decoder configured to adjust DTS (decoding timestamp) according to the predetermined playback mode of the output control unit, the decoder configured to control a decoding time point by comparing the adjusted DTS to an STC count value and decoding the ES data outputted from the VBV buffer.

Independent claim 8 recites, *inter alia*:

> a transmission control unit configured to control a transmission bit rate and transmission time point of the transport stream based on the predetermined playback mode ***and VBV (video buffering verifier) buffer status information***; and
>
> a VBV buffer configured to temporarily store the extracted ES data, the VBV buffer playing a role in buffering between the transmission bit rate and a decoding frame rate, ***the VBV buffer configured to output a buffer status to the transmission control unit.***

Hallberg describes a method and system for creating a trick play video display from a group of MPEG video transport frames. Referring to FIG. 1B, at the receiver 12, a broadcast signal is demodulated in a demodulator 48. The resulting transport data stream 50 is depacketized and demultiplexed in a transport depacketization and demultiplexing subsystem 52. The transport stream data for the individual elementary data streams are stored temporarily in an elementary buffer 54. The data streams for the individual program elements are then decoded and decompressed as appropriate in application decoders, including a video decoder 56 and an audio decoder 58. The decoded data is sent to a presentation subsystem 60 for presentation to the viewer at a time designated by a presentation time stamp associated with each video frame.

As a first order of business, Applicant submits that the current rejection is deficient because the rejection does not identify which items in Fig. 1b correspond to Applicant's claimed output control unit, transmission control unit, demux, VBV buffer and decoder. Applicant assumes that the rejection is based on a finding that elementary buffer 54 corresponds to Applicant's VBV buffer; video decoder 56 and/or audio decoder 58 corresponds to Applicant's decoder; and transport depacketization and demultiplexing subsystem 52 corresponds to Applicant's a) output control unit, b) transmission control unit, and c) demux. Applicant requests confirmation or correction of this assumption should Hallberg be relied upon for any future rejections.

Turning again to Hallberg, the synchronization of the presentation of the elements of a program is controlled by timing information associated with each frame of the video element and each of the data units for the other elements of the program. On the transmit side (Fig. 1a), there is a program clock reference (PCR) that is a sample of the system clock added periodically to the

transport data stream 38 for a program. The PCR is recovered from the data stream at the receiver 12 and used to synchronize the receiver's version of the system clock 55 to the emission station's system clock 33.

At the receiver 12, the frames of the transport stream are temporarily stored in the elementary stream buffer (EB) 54. The video frames are then removed, decoded and reordered for presentation at the system's frame rate. Since information from certain frames must be available in order to decode later frames, the order of transmission in the transport stream GOP is not the same as the temporal order in which the frames were originally recorded and in which they will be displayed. The decoder must reorder the frames of the GOP before they are displayed. In standard forward play mode the exemplary transport stream GOP illustrated in FIG. 2 would be displayed in the order illustrated in FIG. 3.

The capacity of the elementary buffer 54 limits the bit rate of the transport stream. Frames containing differing quantities of data are received at a nearly constant rate from the depacketization and demultiplexing subsystem 52. The data is stored in the elementary buffer 54 until it is removed for decoding at a time specified by the decoding time stamp (DTS) associated with that frame. If data enters the elementary buffer faster than it is removed for decoding the elementary buffer will overflow and data will be lost. The size of the elementary buffer is ***established by an MPEG specified data variable***. Further, the trick play GOP must not require a greater data rate than can be supported by the communication channel 64 between the video recorder 62 and the receiver 12.

In Hallberg, the original MPEG-2 broadcast transport stream is edited at "play time" to create a new MPEG-2 compliant trick play transport stream which can be decoded by a standard

MPEG-2 decoder to produce the desired trick play video display mode. Frames are selected from a transport stream GOP for inclusion in the trick play video display. The trick play transport stream GOP contains some of the P- and B-frames of the original transport stream to produce a relatively smooth trick play display. To create the desired trick play display frame sequence, the frames from the transport stream GOP are reordered, repeated, and time stamped again, as necessary. ***The time required to transmit the new trick play GOP to the elementary buffer 54 is determined and compared to a maximum transmission time which is established from the design limitations for the communication channel 64, an MPEG compliant video decoder 56, and an elementary buffer 54.*** If the required transmission time exceeds the maximum time permitted, the number of frames in the trick play GOP is reduced until the system is capable of transmitting the trick play GOP within the constraints imposed on the system by its design for processing MPEG video in the forward mode at standard speed.

However, contrary to the Official Action, Hallberg does not disclose or suggest

> a transmission control unit configured to control a transmission bit rate and transmission time point of the transport stream based on the predetermined playback mode ***and VBV (video buffering verifier) buffer status information***; and
>
> a VBV buffer configured to temporarily store the extracted ES data, the VBV buffer playing a role in buffering between the transmission bit rate and a decoding frame rate, ***the VBV buffer configured to output a buffer status to the transmission control unit.***

As a first point of order, Fig. 1b and the specification of Hallberg fail to disclose or suggest any feedback signal from elementary buffer 54 to transport depacketization and demultiplexing subsystem 52. Thus, Hallberg does not disclose or suggest a ***VBV buffer configured to output a buffer status to the transmission control unit.*** Accordingly, it is not possible for the transport

depacketization and demultiplexing subsystem 52 of Hallberg to control a transmission bit rate and transmission time point of the transport stream based ... ***VBV (video buffering verifier) buffer status information***.

Admittedly, FIG. 6 of Hallberg shows that the space available in the elementary buffer (EB) 54 is determined (step 200). Also, the size of the elementary buffer is a constant ***established by an MPEG specified data variable***. But Hallberg does not describe that the size of the buffer is provided to transport depacketization and demultiplexing subsystem 52 by elementary buffer 54. Indeed, Hallberg is silent about how the size of the buffer is determined, and is silent about if and how the buffer size is communicated to transport depacketization and demultiplexing subsystem 52.

Applicant further submits that it is not inherent that elementary buffer 54 outputs a buffer status to the transport depacketization and demultiplexing subsystem 52. "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'"[1] Here, it is possible that the size of the buffer is a value stored in a memory of the transport depacketization and demultiplexing subsystem 52 as a factory setting.

In summary, Applicant submits that claims 1 and 8 patentably define over Hallberg because Hallberg does not disclose or suggest

> a transmission control unit configured to control a transmission bit rate and transmission time point of the transport stream based on the predetermined

[1] *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999).

playback mode ***and VBV (video buffering verifier) buffer status information***; and

a VBV buffer configured to temporarily store the extracted ES data, the VBV buffer playing a role in buffering between the transmission bit rate and a decoding frame rate, ***the VBV buffer configured to output a buffer status to the transmission control unit.***

Additionally, Hallberg does not identify how the trick play video display is initiated. That is, it is not clear if the trick play video display is initiated via user action, analysis of the incoming stream, or via a signal from the emission station 10 shown in Fig. 1a. Thus, claims 1 and 8 patentably define over Hallberg for a second reason.

Independent claim 17 is directed to

A playback method in a digital video record/playback apparatus, comprising:

a step (a) of storing transport packets of a selected program, picture information, and a PCR (program clock reference) of the selected program;

a step (b) of performing STC (system time clock) count initialization using a value of the stored PCR and ***incrementing or decrementing an STC count according to a direction of a trick play mode***;

a step (c) of adjusting DTS (decoding timestamp) of a picture to be decoded ***according to the direction*** and multiple-times speed of the trick play mode; and

a step (d) of decoding to output picture data of the selected program by controlling a decoding time point by comparing a value of the adjusted DTS to a value of the incremented or decremented STC count and by referring to the picture information according to the trick play mode.

Applicant acknowledges that direction of a trick play and trick play speed are described in Hallberg. However, Hallberg does not disclose or suggest using direction of a trick play and/or trick play speed to performing STC (system time clock) count initialization or adjust DTS (decoding timestamp) of a picture.

FIG. 6 describes that, if the length of the trick play GOP is acceptable, a new program clock reference (PCR) is determined for and associated with each frame of the trick play GOP 94. First, the space available in the elementary buffer (EB) 54 is determined 200. The current PCR value is compared with the decoding time stamp (DTS) of each frame having a previously assigned DTS. The DTS specifies the time at which the frame is to be removed from the elementary buffer to begin decoding. If the DTS value of a frame is greater than the current PCR value, then the frame remains in the elementary buffer and the frame's size is subtracted from the total capacity of the buffer to determine the available space in the buffer. After determining the available space in the elementary buffer, the size of the current frame is compared to the available space to determine whether the current frame will fit in the buffer 202. If there is insufficient space in the buffer, the current PCR is set to the earliest DTS value of a frame currently in the buffer 204. The effect is to delay storage for one frame period, permitting the oldest frame in the buffer 54 to be removed and the space it occupied to be added to the available storage space. The available space in the elementary buffer 54 is again determined and compared to the size of the next frame until there is sufficient space in the buffer 54 for the frame. When there is sufficient excess space in the buffer 54 to permit storage of the frame, the frame's PCR is set to the current PCR 206. The current PCR value is then adjusted by advancing the PCR by the time required to transmit (TX) the frame to the receiver 208. The time for transmitting a frame is determined by the frame's size and the bandwidth of the communication channel 64.

Following adjustment of the PCR, a new DTS is calculated for the current frame 210. Initially, the new DTS is set to the greater of two values. The first value depends upon whether the previous frame was or was not a B-frame. If the previous frame was not a B-frame, the initial

DTS is set to the previous frame's DTS value plus the time required to decode the current frame which is assumed to be one frame period. This allows the previous frame to be fully decoded before decoding of the current frame begins. If the previous frame was a B-frame, the initial DTS is the previous frame's PTS value. This permits the B-frame to be displayed before the current frame begins decoding. Failing to wait for the B-frame to be displayed could cause removal of the B-frame from the decoder's buffer before it can be placed in the buffer in the presentation subsystem 60. The second potential initial value of the new DTS is the start time of the frame period nearest to, but not earlier than, the current PCR. Setting the DTS to this value forces the current frame to begin decoding only on a frame period boundary and only after the frame is completely received in the elementary buffer 54. If the current frame is a reference frame (I- or P-frame), the current DTS is further set to the maximum of the previously calculated initial DTS or the PTS of the oldest of the last two decoded reference frames. Adjusting the DTS in this manner assures that only two decoded reference frames are allowed to be in storage at any time in the elementary buffer 54, avoiding buffer overflow.

After determining a new DTS for the current frame, a determination is made whether the current frame will be displayed 212. A frame may be decoded to facilitate decoding a display frame, but may not itself be displayed. Due to the forward predictive nature of MPEG-2 only the last decoded occurrence of a frame is actually displayed. If a frame will not be displayed, then it's PTS 214 and temporal reference 216 values are set well beyond the PTS and temporal reference values of the trick play GOP's last frame. When the subsequent GOP is decoded, the initial temporal reference value is reset to zero and frames from the earlier GOP will not be displayed.

If the frame will be displayed, a new presentation time stamp (PTS) is calculated for the frame 218. The PTS is the moment of the system time at which the frame will be presented. The PTS for the initial, displayed frame of the trick play GOP is set equal to the frame's DTS plus the time required to decode the frame. The time required to decode a frame is preferably assumed to be one frame period. If the current frame is not the first display frame of the trick play GOP, then its PTS will be set to the greater of either the frame's DTS value plus the frame decoding time or a target PTS value. The target PTS attempts to position the frame's presentation time relative to other frames of the trick play GOP in a position approximately proportional to that frame's presentation time in the frames of the original transport GOP. The purpose of the target GOP is to temporally smooth the trick play video display. The target GOP is determined by an equation that takes into account .

- first_frame_PTS=the PTS value of the first frame to be displayed in the trick play display;
- frame_period=the amount of time a single frame is displayed;
- target_GOP_frames=the desired number of frames to be included in the trick play GOP;
- first_temporal_reference=the temporal reference value from the original transport stream GOP of the first frame displayed in the trick play video display;
- current_temporal_reference=the temporal reference from the transport stream GOP of the current frame of the trick play GOP; and
- last_temporal_reference=the temporal reference from the transport stream GOP of the last frame of the trick play GOP.

As the result of this adjustment of the PTS, the elapsed times between the presentation of the first frame of the original GOP that is displayed in both the original and trick play GOPs and a display frame of interest is approximately proportional to the relative lengths of the two GOPs.

However, Hallberg does not disclose or suggest a) incrementing or decrementing an STC (system time clock) count according to a direction of a trick play mode; or b) adjusting DTS (decoding timestamp) of a picture to be decoded according to the direction. Indeed, there is no mention of direction in Fig. 6, or in the corresponding description of Fig. 6. Thus, Applicant submits that claim 17 patentably defines over Hallberg.

Similarly, Hallberg does not disclose or suggest adjusting DTS (decoding timestamp) of a picture to be decoded according to the ... multiple-times speed of the trick play mode. Indeed, there is no mention of multiple-times speed in Fig. 6, or in the corresponding description of Fig. 6. Thus, claim 17 patentably defines over Hallberg for a second reason.

MPEP § 2131 notes that "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). See also MPEP § 2131.02. "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Because Hallberg does not disclose or suggest all of the features recited in claims 1, 8 and 17, Hallberg does not anticipate the invention recited in claims 1, 8 and 17, and all claims depending therefrom.

Applicant has considered the remaining applied references and submits the remaining applied references do not cure the deficiencies of Hallberg. As none of the cited art, individually or in combination, discloses or suggests at least the above-noted features of independent claims 1, 8 and 17, Applicant submits the inventions defined by claims 1, 18 and 17, and all claims

depending therefrom, are not rendered obvious by the asserted references for at least the reasons stated above.[2]

Conclusion

Should there be any outstanding matters that need to be resolved in the present application; the Examiner is respectfully requested to contact Michael E. Monaco Reg. No. 52, 041 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.147; particularly, extension of time fees.

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Respectfully submitted,

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Attachment: Replacement Drawings (2 Sheets) – Figs. 1-3

[2] MPEP § 2142 "...the prior art reference (or references when combined) must teach or suggest all the claim limitations.